Research Needs for the Effective Use of Hydrologic and Ecologic Indicators of Ecosystem Integrity for Enhanced Stakeholder Collaboration

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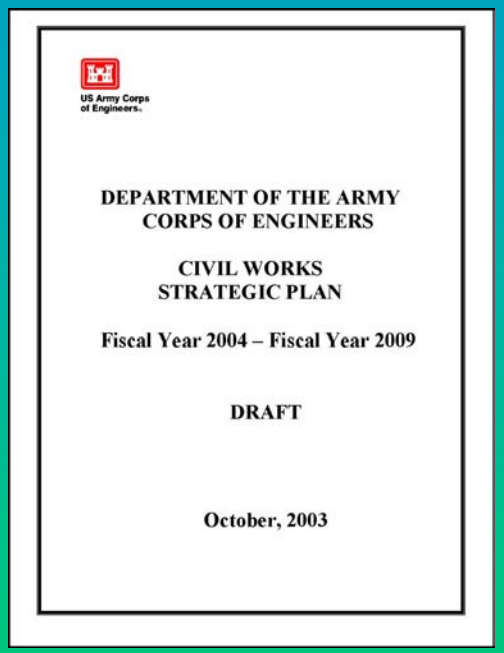
Stakeholder Collaboration


US Army Corps of Engineers.

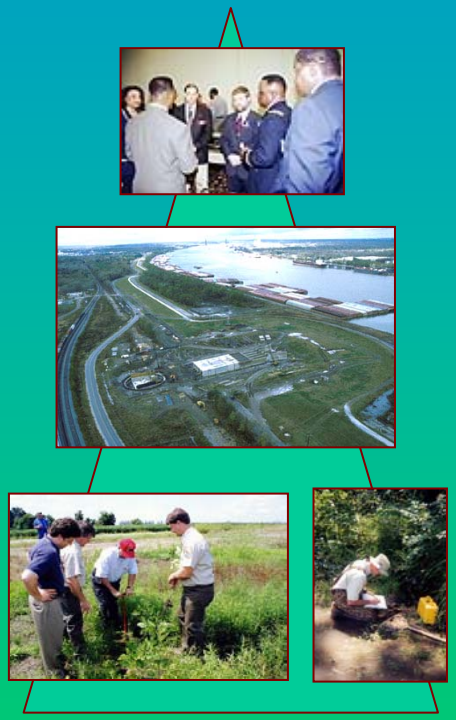
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

CIVIL WORKS
STRATEGIC PLAN

Fiscal Year 2004 – Fiscal Year 2009

DRAFT

October, 2003

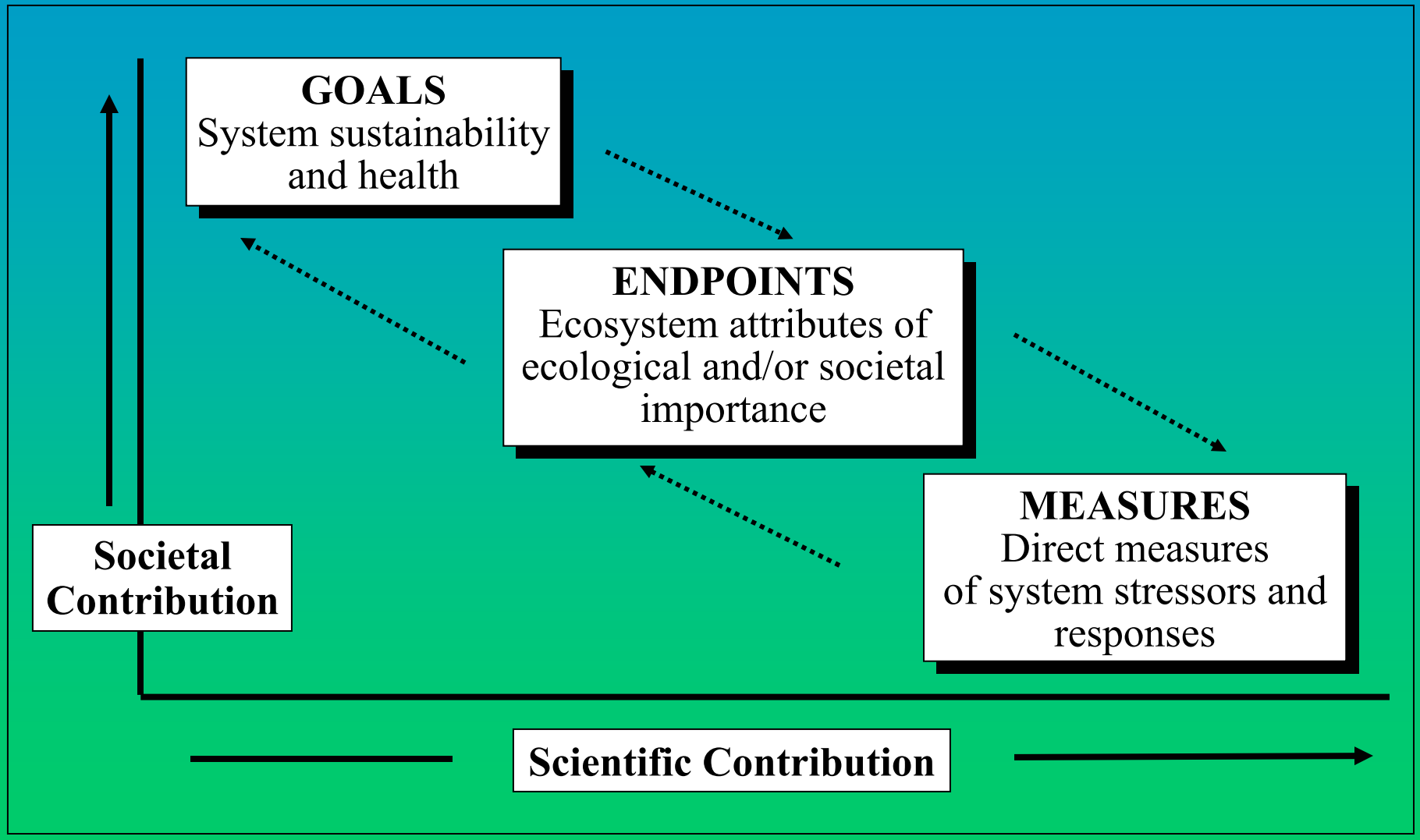


Policy

Practice

Outcomes

Societal and Scientific Input in Decision Making



Harwell et al., 1999 BioScience 49(7):543-556

Ecological Evaluations

Essential Ecological Attributes
EPA SAB, 2002

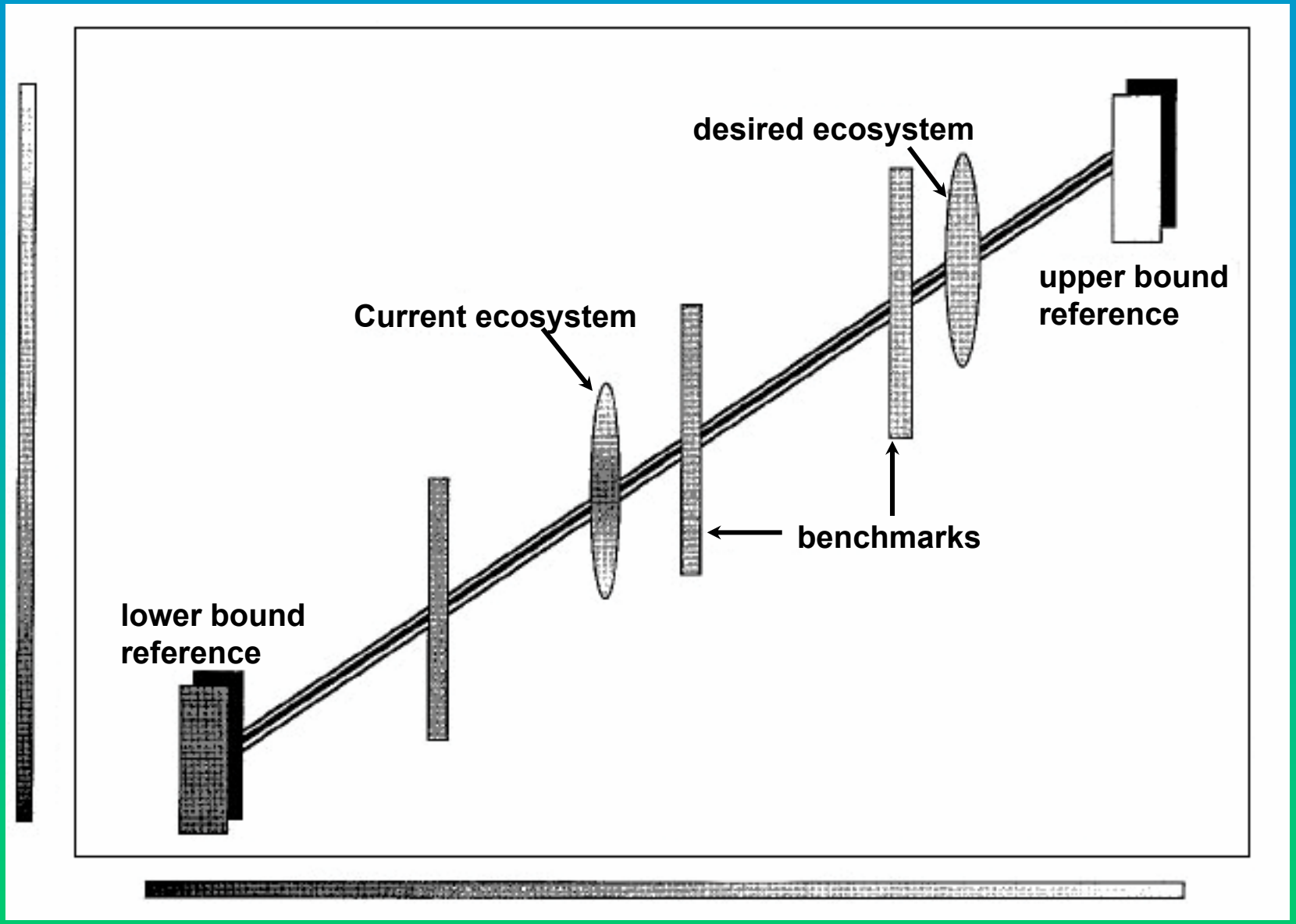
- Landscape condition
- Biotic condition
- Chemical and physical characteristics
- Ecological Processes
- Hydrology and morphology
- Natural disturbance regimes

Aquatic Ecosystem Drivers
ESA Report, 2002

- Biotic assemblage
- Sediment and organic inputs
- Chemical and nutrient inputs
- Biotic assemblage
- Flow regime

Watershed Management

Unaltered → (Reference) ⇄ Human alterations

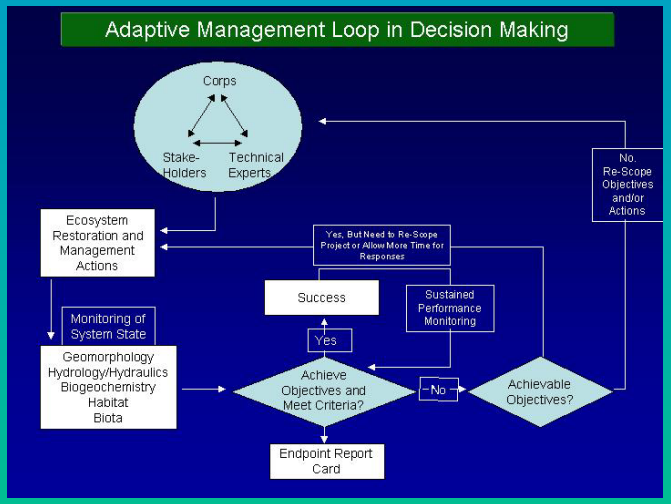


Harwell, et al., 1999 BioScience 49(7):543-556

Hydrologic and Ecologic Indicators

Underlying Concepts

Adaptive Management



Performance Measures

Hydrologic and Ecologic Indicators

Hydrology

River
Regulation
- Flow
- Discharge

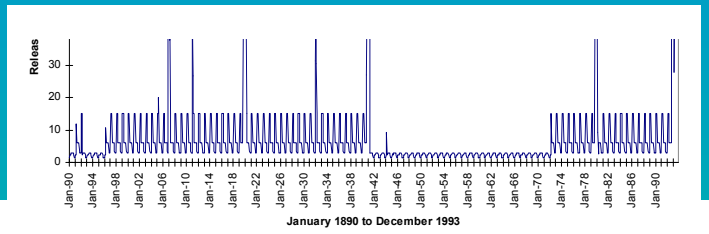


Figure 3.2 Monthly HEC-PRM Releases Based Strictly on Riparian Penalty Functions

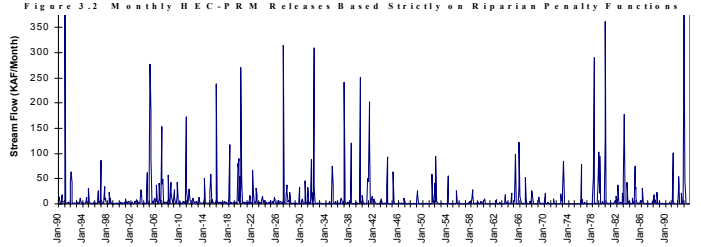


Figure 3.1 Historic (Pre-Dam) Stream Flows

Research Needs

- Flow requirements (magnitude, variability, stage/discharge timing/duration)
- Guidelines for balancing ecosystem needs (trade-offs in community structure)

Hydrologic and Ecologic Indicators

Hydrology and Ecology

Water Quality and Biologic Indicators

Research Needs

- Relationships among stressors (water regimes, food availability, contaminants, species competition) and ecological response

Hydrologic and Ecologic Indicators

Ecology

Biologic
Indicators
- species, guilds
- Biodiversity

Research Needs

- Decision tools/methods for societal needs and policy issues
  - cultural decisions - Ecosystem valuation?

Performance Measures Criteria

(modified from Harwell et al., 1999)

- Understandable to multiple audiences
- Address differences in response over time and space
- Show status when measured
- Able to characterize selected endpoint
- Provide scientific basis for assigning grade (indexes)

Research Needs

- Develop pick list and protocols for implementation
- Develop methods for establishing trajectories for restoration
- Develop appropriate monitoring protocols

Decision Making

Establishment of ecological goals involves a close linkage between scientists and decision makers

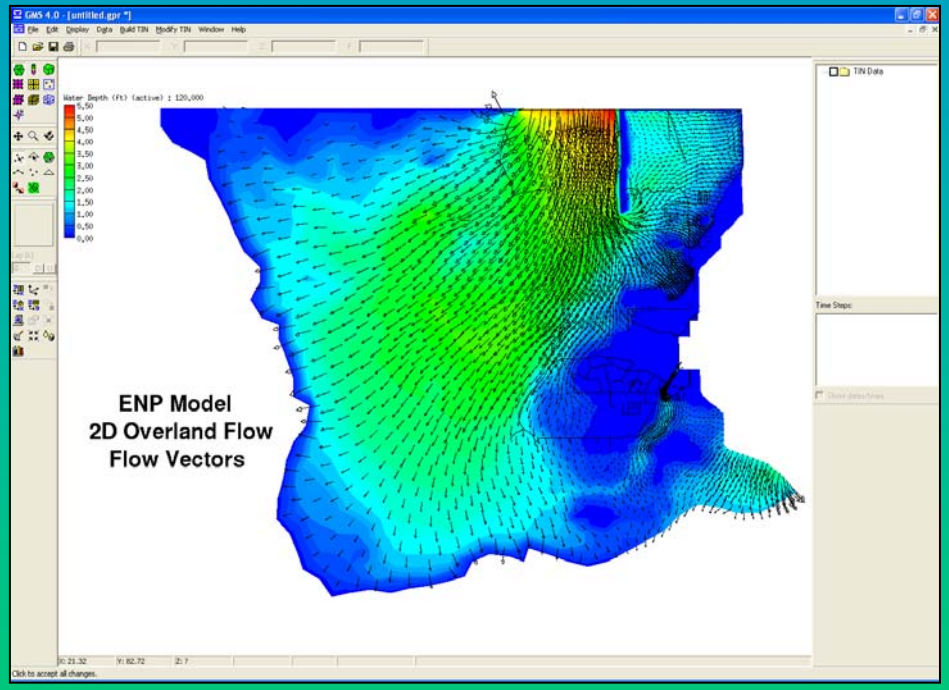
Science informs decision makers by ***characterizing the ecological conditions that are achievable under particular management regimes***

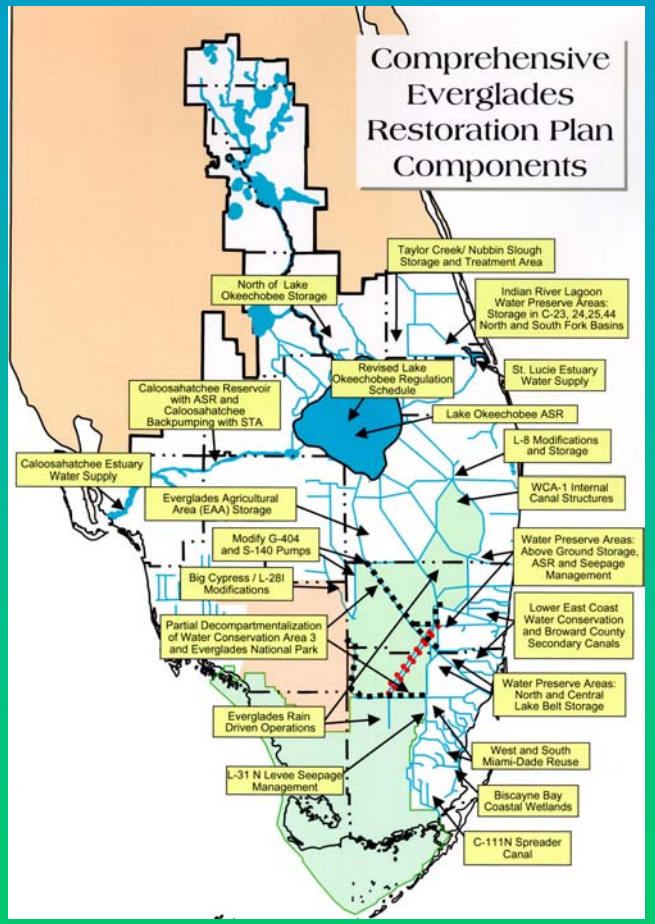
Decision makers make choices (reflecting societal values including issues of economics, politics, and culture

(Harwell et al. 1999)




System-wide Restoration and Management



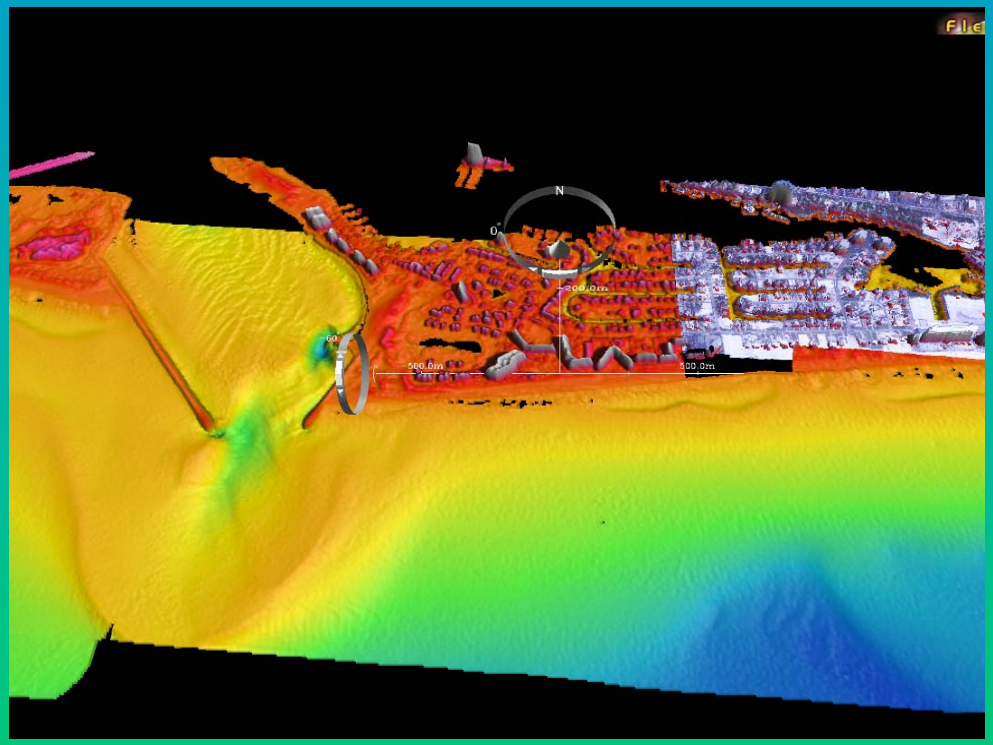


Everglades Restoration

Challenges – tying large scale hydrologic restoration to multiple habitat restoration projects

Emerging Technologies

Topographic & Hydrographic Lidar



Research Needs

- Establishing relationships among signals and ecosystem characteristics

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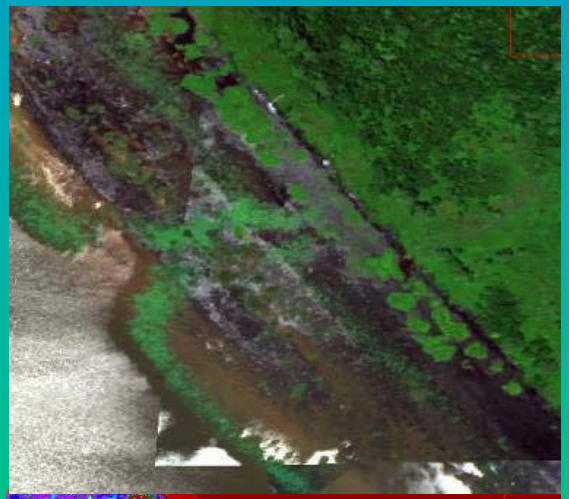
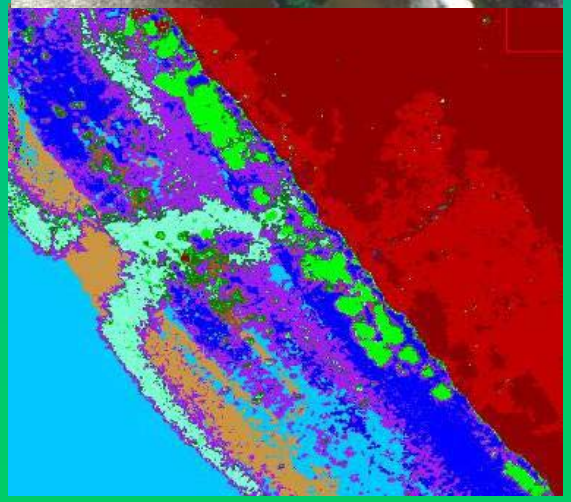
Hyperspectral Imagery – Water and Wetland Classification





(380 – 1050 nm)

Hyperspectral image, true color

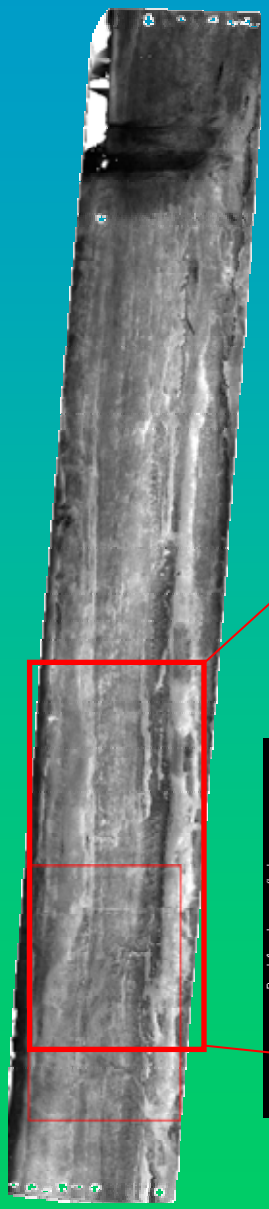
Classification Key

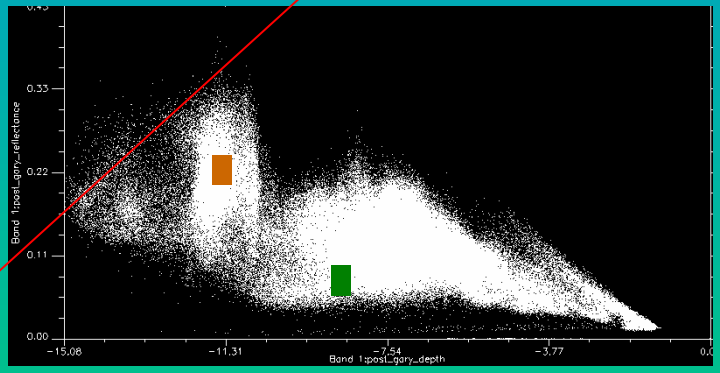
- Water
- Dense Floating Vascular
- Dense SAV, Emergent
- Apparent Bottom
- Dense SAV
- Emergent Grass (Wild Rice, etc.)
- Forest
- Grasses
- Undetermined Floating Grasses

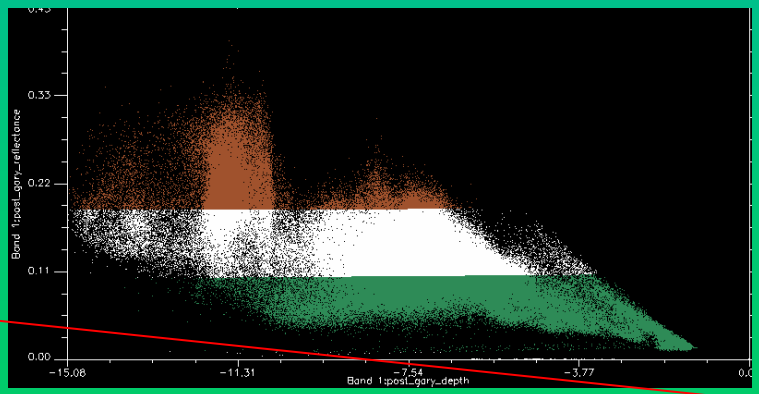
Water and Wetland Image Map

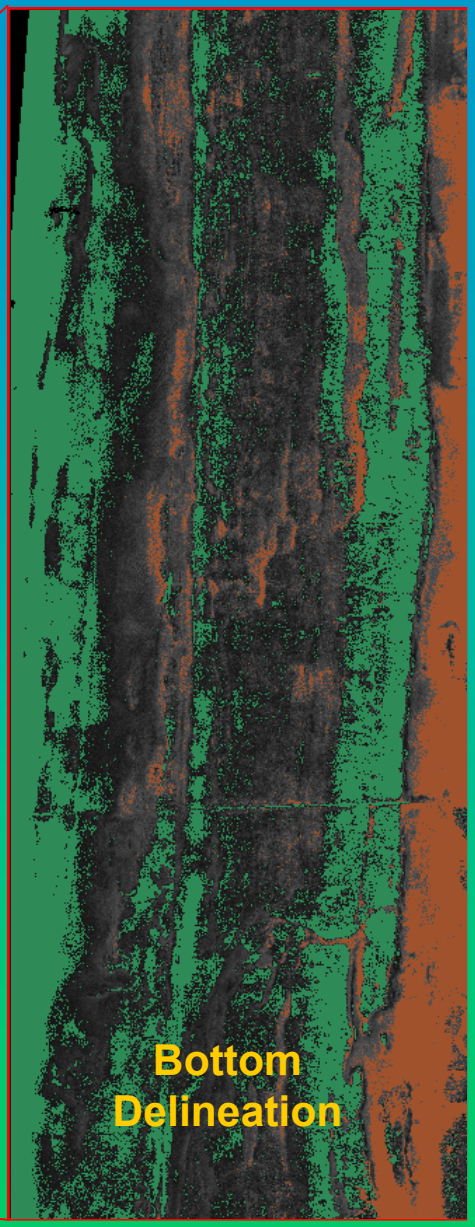
POC Jeff Lillycrop, ERDC

Pseudoreflectance









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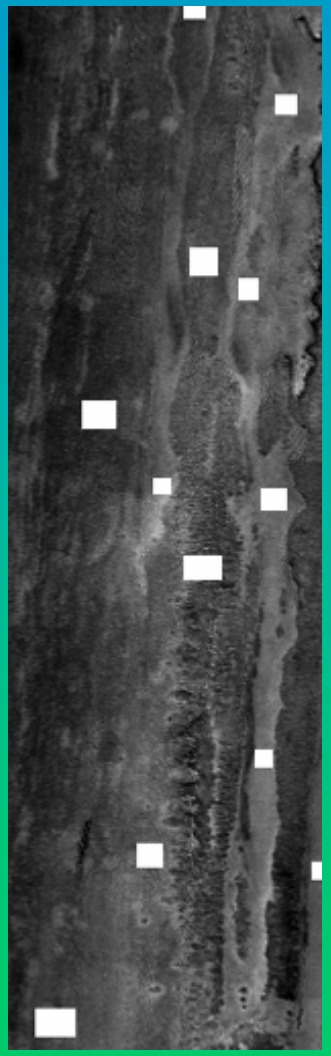
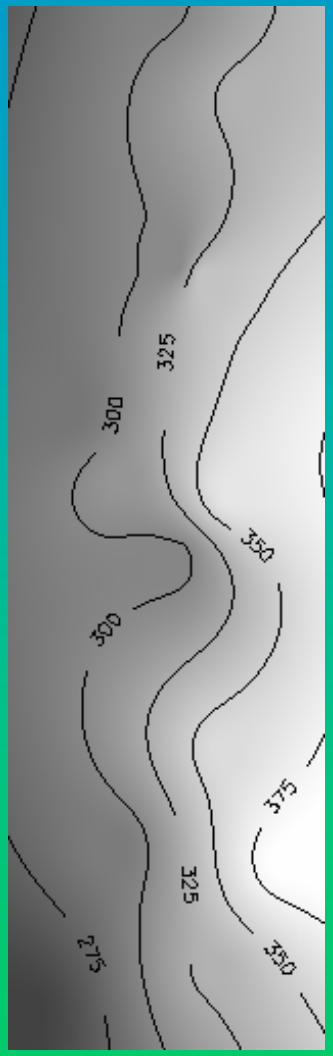
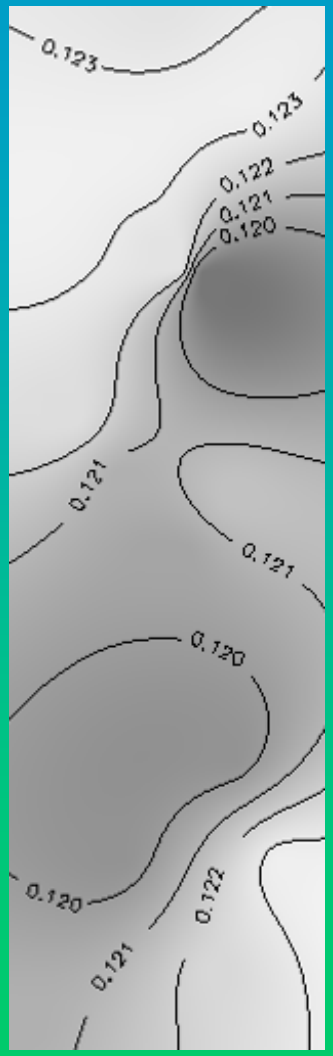
Bottom Type → Water Quality







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Points to Ponder

Research Needs Include Issues of "Currency" "Accumulation" and Scale

- Comparability of Habitat Units
- Indicators of systemic/cumulative effects of multiple projects (landscape level indicators)
- Dynamic and compatible/consistent measurement and monitoring approaches

Time